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ABSTRACT

This document contains the following papers on special needs from the SITE (Society for Information Technology & Teacher Education) 2001 conference: (1) "Preparing Teachers To Use Assistive Technology in Inclusive Settings" (Dina Rosen and Arlene Bloom); (2) "Academic Achievement Problems: Developing Curriculum Based Software To Help Low Achievers" (Xavier Bornas and Jordi Llabres); (3) "The Need for Assistive Technology in Educational Technology" (Terence Cavanaugh); (4) "Forming Personnel, Creating Cultures. Participative System for Preparing Content Providers for Homepages Addressed to People with Special Needs" (Ana Loureiro Jurema and others); (5) "Preparation of Educators To Provide Effective Computer-Based Assistive Technology Accommodations for Students with Disabilities" (Suzanne Lamorey and Ivana Bartarelo); (6) "Website 101: Creating Annotated Special Education Bibliotherapy with Children's & Young Adult Books" (Philip Lanasa and others); (7) "Integrating Technology in Classrooms with Learning Disabled Students: Teachers' Needs and Professional Development Implications" (Jean Loiselle and others); (8) "The Integration of Assistive and Adaptive Technologies into the Preservice and Advanced-Level Courses of Instructional Technology and Special Education" (Caroline M. Crawford and Sylvia S. Martin); (9) "Designing Accessible Web Sites for People with Disabilities" (Robert V. Price); (10) "Assistive Learning within a Special Needs Environment" (Randy L. Seevers and others); and (11) "Special Educators' Technology Literacy: Identifying the Void" (Roberta K. Weber and others). Most papers contain references. (MES)

SPECIAL NEEDS

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I recently read an article about a school for special students. Spending for these students was two to four times the average for students attending 'regular' schools in that state. The school was operated as a residential school and the students had access to many programs that the students in less funded schools did not. The test scores for these special students were, for the most part, outstanding. The state was very proud of this school for special students. However, the school, which was to be one of several in the state, was very expensive to run and maintain. The state therefore decided that this school for special students would be the only one of its type that would be funded. How is it that this one school for special students received such funding and such attention? It turns out that the school is the Illinois Math and Science Academy and these special gifted students were selected after a very rigorous admissions process.

No one denies that students who can do well in math and science (or music or art) should be penalized for their abilities. Quite the contrary, these students should be encouraged to excel through their talents. But what about the students who have been placed in 'special education' classes. Are these students, too, not special?

Each state provides guidelines as to how students who fall within their definitions of 'special education' should be assisted. However, these guidelines are often bureaucratic in tone (as is generally required when developing guidelines). The articles in this section of the Technology and Teacher Education Annual provide a varied and humanizing look at both the students and the educators who work in the area of special education. As you will see, the money is often not there. The teachers are making remarkable innovative and important uses of technology. As you read through these articles, remember that these are special teachers and researchers working with special students in special circumstances. Remind yourself that we are lucky to have such special people working with us.

Preparing Teachers To Use Assistive Technology In Inclusive Settings

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"Abstract"
With the passage of special legislation for the education of children with disabilities, educators are required to provide services to children with disabilities and consider the appropriateness of new technologies as a tool or intervention. This article considers what teacher educators can do to familiarize their preservice teachers with options in assistive technology and prepare them to work with assistive technology. Preservice teachers need minimum competencies in technology and assistive technology. Teacher educators by providing three-prong instruction may play an important role in awakening in each prospective teacher the desire and ability to be the conduit for using assistive technology to develop the potential of each student with special needs.

The Education for All Handicapped Children Act (PL94-142) was passed in 1975 to address the needs of students with disabilities. It was renamed The Individuals With Disabilities Education Act (IDEA) in 1990 and was reauthorized and amended in 1986, 1990, and 1997. Special Education programs in all states are required to fulfill the mandates of this federal legislation or face the loss of funding to local districts. IDEA requires that students with special needs be educated in the Least Restrictive Environment (LRE). Although students with special needs may be placed in self-contained classrooms, the vast majority of them are included in the regular classrooms. Inclusion refers to the placement of children with special needs in age-appropriate settings in which their needs are addressed by the regular education teachers as well as special educators.

With the passage of IDEA Amendments of 1997, Public Law 105-17 educators are required to consider the appropriateness of new technologies as a tool or intervention for every student with an Individualized Educational Programs (IEP). An increasing number of students are being prescribed assistive technology. Assistive technology can help children compensate for their disabilities, focus on their abilities, and reach their full potential. If this trend continues, an increasing number of regular education teachers and special education teachers will need to have knowledge of and experience with assistive technology.

This article considers what teacher educators can do to familiarize their preservice teachers with current options in assistive technology and prepare them to work with assistive technology. Preservice teachers need minimum competencies in technology and assistive technology. Teacher educators can provide three-prong instruction. First, preservice education programs should include an exploration of the variety of challenges students may have. Second. training should also provide familiarity with the laws and terms associate with assistive technology. Third, preservice teachers should have hands-on experience with assistive technology hardware and software. All teachers need these three kinds of information in order to assess the educational challenges and learning differences of each student and to provide assistive technology devices and services.

Section 602 of the Ammendments of IDEA (1997) define the terms "assistive technology device" and
ve technology service". The term "assistive technology device" means any item, piece of equipment , or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disability. Assistive devices allow children with special needs to access technology in the most efficient way. Educators need to be familiar with a variety of alternate keyboards, become familiar with QWERTY (standard) keyboard,

sample touch screens, trackballs and adaptive devices for students with physical disabilities. Familiarity with assistive listening devices and Braille options may be necessary as well. Examples of assistive technology devices include: adapted track ball, digital camera, IntelliKeys MIDI creator, scanner, switches, touch screens and specialized software. The term "assistive technology service" means any service that directly assists an individual with a disability in the selection, acquisition, or use of an assistive technology device. Such services include the evaluation of the needs of children, providing for the acquisition of asssitive technology, selecting designing, customizing, adapting, and repairing assistive technology.

Regarding the first prong, preservice teachers can learn about special needs children from the literature and from field experiences in a variety of setting that service special needs children. The instruction can be integrated into curriculum courses or taught in separate courses designed specifically to address inclusion and assistive technology. For example, instructors teaching in the curriculum areas of language, reading and literature can consider how to identify students with language-based learning disabilities and how to use assistive technology as an intervention for these children. Instructors can consider assistive technology devices that help children who have difficulty decoding or comprehending text, writing, organizing, evaluating, remembering or generally getting their thoughts in written form onto paper. **L D OnLine** is a website that provides an interactive guide to learning disabilities for parents, teachers, and children (http://www.ldonline.org/).

Regarding the second prong, review of the laws that support assistive technology can be conducted. Preservice teachers can use the Internet to identify current law cases and discover more about agencies that provide services to children with special needs. Laws which should be considered are IDEA, Section 504 of the Rehabilitation Act (Rehab Act) 1973, Americans with Disabilities Act (ADA) 1990, and the Telecommunications Act of 1996. Some helpful web sites for national information include (a) *Center for IT Accommodation (CITA)*: Provides information on legislation and policies on information systems accessibility - http://www.itpolicy.gsa.gov/cita/index.htm (b) *The National Center to Improve Practice (NCIP)*: NCIPnet focuses on special education and technology and augmentative communication- http://www2.edc.org/NCIP/ (c) Office Of Special Education And Rehabilitative Services-United States Department Of Education: Provides an overview of schools' responsibilities toward ensuring that technology is accessible, and a listing of resources in the Federal government to assist schools- http://www.ed.gov/offices/OSERS/whatsnew/whatsnew.html. Individual states are also likely to have agencies and websites.

Regarding the third prong, preservice teachers need to be familiar with hardware and software that can assist in the inclusion of students with disabilities into the regular classroom as well as make the computer accessible to students with disabilities. They should have hands-on experience with hardware and software that support a variety of curriculum areas. For example, there is software that supports the writing process through the use of features such as auditory feedback, word prediction and organizational strategies offer a variety of applications for the classroom. Reading software may provide reading and cognitive learning strategy support through auditory feedback, enhanced visual display and customization to meet specific student needs. These include optical character recognition systems, e-text, and timesaving resources. Math software may provide organizational support, auditory feedback and additional problem solving options. Two helpful websites include **ABLEDATA:** A national database of information on more than 17,000 products that are currently available for people with disabilities- http://www.abledata.com/ and **The Alliance for Technology Access (ATA):** Provides location information for the Alliance for Technology Access regional centers. The Alliance assists individuals with disabilities access technology, mainly through computer resources- http://www.ataccess.org/

Assistive technology requires clear planning to benefit the students involved. Preservice teachers need to have a clear understanding of the reason why it is being incorporated into the education of children with disabilities or the technology becomes just another add-on. Preservice teachers need to develop an awareness that many possibilities for assistive technology exist within an inclusion class environment. . The teacher educator may play an important role in awakening in each preservice teacher the ability to be the conduit for using assistive technology to develop the potential of each student with special needs.

Academic Achievement Problems: Developing Curriculum Based Software to Help Low Achievers

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Abstract: Low achieving children (LA) usually need a very individualized instruction. Teachers rarely can give them this kind of instruction because they have too many children in the classroom. Computer technology may be extremely helpful for those students. However, the lack of contact between developers and school teachers leads to several problems: lack of motivation, cognitive confusion, and teachers' resistance. If computer technology has to help LA, the instructional software must be based on the school curriculum. From our own experience in developing curriculum based software we can underline several guidelines. We took the curriculum materials as the base for the software we were going to develop. Teachers told us what specific contents they were going to teach, and these contents were the ones the software included. The curriculum based software we have developed proved to be useful to teach LA the selected academic contents and strategies.

Introduction

Low achieving children usually need a very individualized instruction to reach the average academic level of their classroom group (Bornas, Servera, & Llabrés 1997). Teachers, however, rarely can give them this kind of instruction because they have too many children in the classroom. Although some help is provided for disabled children (e.g. blind or developmentally retarded), by the school administration, low achievers (LA) remain underattended (Wong 1996). In fact, they often do not cause big problems to their teachers nor to the school. However, repeated failures lead them to a growing academic delay or décalage, and many of them will not finish their primary studies.

Computer technology may be extremely helpful for those students, mainly because the computer can repeat the same instructional content as many times as the student needs to master it (Burt & Ryan 1997; Torgesen & Barker 1995). Hundreds of different addition exercises, for example, can be easily presented to the student when he or she needs to master this arithmetic operation. Hundreds of pages can be shown to let the student read and to improve his or her reading skills. However, a serious problem comes up at this point: having computers in the classroom does not help LA unless an appropriate software is installed on them (Bender & Bender 1996). The quantity and the variety of the software contents are important but much more important is the coherence between its teaching style ant the teaching style of the regular teacher and the school.

Instructional software is often independent of the school curriculum.

Most developers are not in contact with the specific school where the software will be used, and they make use of general, non-specific curricular or educational trends to select the software contents, to set the learning sequences, to program what feedback the user will get as a result of his or her actions on the computer, the global interactivity level between software and children, and so on, thus configuring an educational "style" for the software they are creating. The lack of contact between developers and school teachers leads to several problems. Firstly, children may wonder why they need to do the programmed tasks if these are not the ones they usually do with his or her teacher. Students can think that doing these tasks has no sense in order to learn what high achievers already learned, say reading fluently or dividing. In addition, if the computer tasks are too repetitive they can bore the student and lead him or her to avoid them. The lack of motivation can be the final result in both cases (Lewis 1998).

Secondly, since the teaching style of their teachers may be absolutely different from the educational "style" of the software, children can show cognitive confusion and they can have some trouble to learn specific concepts or strategies. It does not matter how some things are taught they will be learned by all the students (e.g. the names of the basic colors). Other things, however, have to be taught the same way to make sure that LA learn them. For example, there are several ways to teach how to subtract 17 from 20. Probably, high achievers will have no problem to learn two or more subtracting strategies simultaneously, but LA may get confused if they are taught a different subtracting strategy before they master the first one. On the other hand, however, if a specific strategy is not learned by the student then he or she has to be given the opportunity to learn another strategy to solve the same task.

Thirdly, teachers may be reluctant to use the software if (a) the software contents are not the ones they would have chosen, (b) the software instructional style is not coherent with their own teaching style, and (c) the software may cause motivational or cognitive problems to their students.

Guidelines for Developing Curriculum Based Software

If computer technology has to help LA, the instructional software must be based on the school curriculum. Therefore, software developers have to be in contact with the school and the teachers. Furthermore, instructional sofware developers need some knowledge about curriculum related aspects (what a curriculum is, why it is important, how teachers use it, and so on) to understand the teachers demands when they are planing to use computer technology in the classroom.

From our own experience in developing curriculum based software (an experimental study will be presented at the SITE2001 Conference) we can underline several guidelines that, in our opinion, have to be taken into consideration. The software we are referring to was designed to help third grade LA students to improve their performance in reading comprehension and math.

Firstly, the LA students were selected not only because of their poor performance on the evaluation tests that we administered them but also because their teachers considered them as LA. This is to say that the opinion of the teachers was an essential criteria during the students selection process. In fact, some students who performed lower than the average on the standard tests were not considered LA by their teachers, and viceversa, some average performing students were selected since their teachers considered them as LA. The knowledge a teacher has about his or her sututdents can't be replaced by the knowledge we get when we administer them an academic performance test.

Secondly we looked at the books and other curriculum materials that students were using regularly in the school, and we took them as the base for the software we were going to develop. For example, we bought a book of the same publisher and the same level than the one the students used to improve their reading skills in the classroom. The reading software exercises and the classroom reading exercises were quite similar. This was not only true for the sofware contents but also for the learning strategies the software was designed to teach.

Thirdly, teachers told us what specific contents they were going to teach during the next two months, and these contents were the ones the software included. Therefore, while LA sututdents used the computer software they learned the same contents than the other students did. In addition, although the software was not strictly linear, the learning sequence through the curriculum contents was also very similar.

Finally, it is worth to say that the sofware was not only based on the teachers knowledge nor on the shool curriculum. To develop the software we made use of the psychological and educational knowledge about (a) low achieving students and their cognitive problems, (b) learning strategies and metacognition, and (c) effective teaching strategies. In other words, the shool teachers and the school curriculum must be considered carefully to develop curriculum based software, but developers need knowledge about the learning and teaching processes.

Conclusion

The curriculum based software we have developed proved to be useful to teach LA the selected academic contents and strategies, although at the end of the computer using period LA performance was still lower than performance of high achievers. In addition, beyond the performance results we would like to underline that LA students really liked the software and they were well motivated to use the computers. Teachers got very involved in the research process since they participated from the beginning, when LA students were selected, along the whole development process: contents, strategies, feedback and reinforcement, evaluation, etc.

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The Need for Assistive Technology in Educational Technology

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Abstract: This paper will address definitions, services, levels of technology and application of assistive technology concepts as they relates to education. An overview of the NCATE and ISTE guidelines concerning assistive technology, and the current elements of the graduate educational degrees concerning assistive technology is provided. Federal legislation concerns the application of assistive technology in an educational setting and its possible impact on educational technologists. A model is proposed for a course concerning assistive technology and universal design to better prepare instructional technology graduates to enhance the performance of students with disabilities and design educational material for increased accessibility. This session is intended for educators in instructional technology and exceptional education programs.

Disabilities rights leaders have said that the application of technology will be the equalizer of the 21st century (Flippo, Inge & Barcus 1995). Through the use of assistive technology (AT) devices, many students can decrease their isolation and become an important part of a regular classroom, their least restrictive environment. Assistive technology is a basic tool in the educational process for any individual who may be experiencing a disability. Technology that is used as tool in education is the basic definition of educational technology.

This paper will address assistive technology and services, overview the current assistive technology elements of graduate educational technology degrees, and present a model for including assistive technology to better prepare instructional technologists to participate and enhance the performance of students with disabilities.

What is Assistive Technology?

The Technology-Related Assistance for Individual with Disabilities Act of 1998 (PL 100-407) gave us the first legal definition of assistive technology devices and services. An assistive technology device was defined as: any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities. An assistive technology service was described as: any service that directly assists an individual with a disability in selection, acquisition or use of an assistive technology service.

What are the Levels of Assistive Technology Use?

In considering assistive technology, you must consider the environment, the individual, and the characteristics and levels of the technology (Gitlow 2000). Assistive technology may be classified as high, middle or low tech. The concept of a high technology device usually includes items that require computers, electronics or microchips to perform some function. Low technology usually does not require an outside power source. An example of high technology is a computer. The application of technology could range from having a computer read a book (high tech) to printing out material in a larger font to a student using a magnifying glass (low tech) to read material.

Along with considering the level of the technology, consider the levels of how the necessary assistive technology item will be applied. The levels in applying the assistive technology solution include whether the item is personally, developmentally, or instructionally necessary (Judd-Wall 1999). The personally necessary level is concerned with assistive technology devices that are used by an individual student, such as a pair of color blind glasses to enable a learner to more effectively interact with his/her environment. Developmentally necessary devices may be shared among individuals. These devices help meet an educational need based on a developmental delay, which ideally would be improved, eliminating the need for the item in an individual's

future. Lastly, instructionally necessary devices are those which modify the instructional process at a course or grade level, and do not need to be moved with the user as he or she progresses to the next level in education.

What is Educational Technology?

Educational or instructional technology can be hard to define. At its simplest it can be the application of technology in teaching or education, but many feel that it is much more than that. Perhaps the most encompassing definition is from University of North Carolina Media Services (1997) which states that: "Educational technology is the application of research, learning theory, emergent technologies, and child and adult psychology to solving instructional and performance problems." The Presidential Commission on Instructional Technology highlighted four areas in which educational technologists perform: 1) design of instruction, 2) production of instructional products and services, 3) management of instruction, and 4) evaluation of instruction.

Assistive Technology in the Graduate Educational Technology Program

The National Council for Accreditation of Teacher Education (NCATE) accreditation in association with the International Society for Technology in Education (ISTE) requires that assistive technology be addressed within such higher education programs as educational computing and technology leadership. The guidelines and standards for those programs state that a graduate of such a program should "demonstrate awareness of resources for adaptive assistive devices for students with special needs" and be able to "identify and classify adaptive assistive hardware and software for students and teachers with special needs and locate sources to assist in procurement and implementation" (NCATE 1999).

However, assistive technology is, for the most part, only discussed as a small component of technology integration classes or is thought of as being part of the "special education" section. There exists the need for the addition of a course devoted to the application of assistive technologies, awareness of the possible limitations of users, and universal design in a graduate educational or instructional technology program.

A review was conducted of instructional and educational technology programs within the colleges of education across Florida's state university system. According to their published programs of study, none of the state colleges of education was offering a course specifying assistive technology in its title or available description. A similar limited review was conducted of universities nationwide that offered graduate programs in educational or instructional technology. From this survey, it was found that less than twenty percent of the colleges that offered an educational technology degree provide courses focusing on assistive technology.

Impact on Instructional Technologists

As part of the federal Individuals with Disabilities Act IDEA amendments of 1997 and 1999, statements now require assistive technology devices and services to be considered on an individualized basis and become a part of the individual education plan (IEP) if the child needs them to benefit from his educational program. The individualized education program (IEP) is a written statement for a child with a disability that is developed, reviewed, and revised at the child's school. The IEP's occur each year for every child with a disability and they are developed by members of the IEP team including parents, teachers, special education teachers, administration and others. Section 508 of the Rehabilitation Act Amendments of 1998 is the most extensive new law with wide ranging effects. This ruling requires that all US federal agencies make their information technology accessible to their employees and customers with disabilities. The law gives federal employees and members of the public the right to sue if the government agency does not provide comparable access to the information and data available to people without disabilities. Section 508 applies to Web sites that are produced for government agencies. All state agencies that receive federal funds under the Assistive Technology Act of 1998 are also required to comply with Section 508 requirements. Schools seeking to comply with legal requirements regarding students with disabilities need faculty with knowledge of assistive technology

applications. Based on NCATE accreditation requirements, it would be reasonable for a school administrator or other official to expect that an educational or instructional technology graduate from an NCATE accredited program would be able to effectively contribute to a student's IEP team. These expectations would include that such a graduate be able to make effective judgments and recommendations concerning assistive technology and universal access.

Assistive Technology Course Development

With the rapidly aging population of the United States, there is also a growing need for assistive technology and universal design. To receive federal funding organizations must be IDEA and Section 508 compliant. There exists a need to provide instruction on assistive technologies and methodology to make technology products such as computer programs and web pages handicapped accessible.

Instructional and educational technology specialists require more extensive experience and education concerning assistive technology than they currently receive. Instructional/Educational Technology graduate programs should devote a course to the presentation of the basic concepts and applications of assistive technology. This course could be offered as a requirement in the current university master's instructional technology program and as an elective in its master's of education or exceptional education programs. The NCATE and ISTE standards state that for initial certification, a teacher should "demonstrate awareness of resources for adaptive assistive devices for students with special needs." These standards would be well met by such a course. The technologies and strategies presented in a course concerning the application of assistive technology would also address many of the other NCATE guidelines associated with specialty programs such as educational computing and technology leadership.

An assistive technology course could be designed as an introductory or survey course in the application of technology as assistive and adaptive devices, software and strategies. This course could present strategies for students who are physically or mentally impaired, and may be in a mainstreamed situation. The purpose of the course material would be to teach about the use of technologies to overcome handicaps and improve functionality. Course topics could include: basics of assistive technology; legal/ethical issues associated with assistive technology; assistive technology and the individual education plan (IEP); levels of assistive technology; technology adaptations; Windows and Macintosh built-in accessibility tools; text-to-speech and speech-to-text; universal design and the internet; English as a second language, and physical and learning disabilities. An additional facet of such a course should also be designing web-based information to be universally accessible, covering such topics as making web pages more accessible and designing multimedia to overcome user handicaps. The assessments and activities of the course should include hands-on experiences with assistive technologies. Activities should be designed to include visitations to schools or labs to see assistive technology being used, the application and use of text-to-speech and speech-to-text programs, experiences with adaptive switches and toys, and even experimentation with environmental control hardware and software

During discussions and interviews with inservice teachers, counselors, physical therapists, parents, and assistive technology organizations, a need for training and education in the area of assistive technologies was identified. Through continuing discussions, some basic areas of need in assistive technology education were identified. Visitations were conducted at the Assistive Technology Educational Network (ATEN), Florida Diagnostic Learning Resources (FDLRS) and Florida Instructional Materials (FIMSE) labs. The goal of the visitations was to learn about the state of the art and the programs being offered, and to understand the components of the AT community. Additional research continued through conducting a literature survey in the field, observing at schools and labs, and studying current Exceptional Student Education (ESE) and Instructional Technology (IT) programs offered at universities. In order to begin to fill the need that was perceived, a course outline was developed and components were taught at daylong hands-on workshops designed to introduce instructional technologists and teachers to assistive technology. From these preliminary discussions with professionals in the assistive technology community, it was found that an assistive technology course would be appreciated and that course delivery through distance learning would be preferred. Many of the potential students expressing interest in such a course were unable to travel to a university. As an educational technology program course, it would have an added benefit as a recertification course for ESE professionals and general education teachers.

After an initial course outline was developed, members of parent support organizations such as the Statewide Advocacy Network on Disabilities (STAND), university professionals in special education, assistive technology state organizations such as Florida Diagnostic and Learning Resources System (FDLRS) and Assistive Technology Education Network (ATEN), future students in exceptional education, and other instructional technology professionals were asked to provide feedback on the course design, goals, topics and assessments. All were extremely pleased with the idea of the material becoming available for instructional technologists, exceptional student education (ESE) and general education educators. In its current form, the AT course "Technologies for Special Populations" (see appendix) is designed as an introductory course in the application of technology as assistive and adaptive devices in education. The course itself should model effective design practices. For example web pages will be designed for universal access and course materials and multimedia will be developed to be handicapped accessible. Because of its online delivery, the course serves as a model of information presented through an assistive medium.

Learning Strategies

The Technologies for Special Populations course stresses hands-on experiences with various assistive technology approaches and devices. One of the main course goals is designing methods for a student to have actual experiences with the technology going beyond readings and looking at images about the technology. Students are expected to purchase, train, and use voice input systems, install and use an environmental control system, purchase and use a voice repeater, and use speaking software and hardware devices. Student interactions with assistive technologies fall into five areas. Students interact in an online forum, they have field experiences, and they complete technology projects, in addition to using standard materials such as tests and papers.

One of the strategies used in the Technologies for Special Populations course is the forum. Students participate for themselves and also analyze what other students have done and provide feedback to their classmates' thoughts. Forum topics include case studies that students use in experimenting with, suggesting and explaining assistive technologies. Further forum topics encourage students to discuss and evaluate the impact that the assistive technologies have on them while they use various devices and programs such as environmental control, voice input, and text-to-speech.

Students will be required to observe the use of assistive technology as part of their field experiences. Students are asked to observe a student who uses assistive technology devices, or investigate and visit an assistive technology demonstration lab. Using an assistive technology device checklist and observation form, students would observe assistive technologies being used and then contribute in an online exchange concerning their observations.

Currently projects are being designed to give students additional experiences with assistive technology in evaluation, adaptation, and creation of assistive technology devices. Students evaluate web sites for universal access, compare various assistive technology software products, compare assistive technology hardware tools, and even complete an evaluation of a student related to the use of a specific assistive technology. Students will use software to create a communication board that augments communication within a specific class or function. Additional support is being sought for the creation of a supplemental traveling assistive technology box. Sent through the standard mail system, this box would provide students access to the more expensive technologies including touch screens, alternative keyboard inputs, talk boxes, close captioning devices, and more.

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Rehabilitation Act Amendments of 1998, Section 508

Appendix: Syllabus for Technologies for Special Populations (an introduction to assistive educational technology)

Course Description: This course is designed to be an introductory survey course in the application of technology as assistive and adaptive devices and strategies for special population students, ESOL, learning, physically or mentally impaired, and are in a mainstreamed versus a profound situation. The basic concept of the course material is to learn about and use technologies to overcome handicaps and improve functionality. The course will be focusing mostly on integrating technology/computer based applications and adaptations. Course topics include built in adaptations: Windows/Mac, legal issues, ethical issues, Individualized Education Plan (IEP), support agencies, English as a Second Language learners (ESOL), Exceptional Student Education (ESE), learning disability, environmental control, vision assistance, physical impairments, motion impairment, voice control, voice input, Text-to-Speech/Speech-to-Text, technology adaptive strategies: study, outline, concept mapping, toy adaptation, and universal access/design.

Topic Outline:
Introduction to assistive technology; Legal issues and the IEP; ESOL as a special population; Toys, Switches, and other adaptations; Windows & Mac built-in Accessibility tools; Text to Speech & Speech to Text; The Internet; Mobility and Physical Impairments; Hearing and Vision; Learning Disabled

Required course materials:
Internet Access, Speech to Text program, Environmental control materials & program, Voice recorder or 4-frame talker and Internet access. Texts for the class are *The Internet: an inclusive magnet for teaching all students* published by World Institute on Disability and *Learning to Read in the Digital Age* by Anne Meyer and David Rose

Assessments

Information/Research Paper:
The paper should have a focus on integrating and/or implementation of assistive technology in a school setting. What does this mean to education? How does it change the role of teachers, students and schools? How is the nature of technology changing instruction? How does change itself change what we do as teachers? This paper should examine issues, societal trends, and their effect on education. The final topic for the paper must be approved by the instructor. Paper should be three to four pages, in APA style, pay attention to format, spelling, and grammar.

Projects:
Evaluations - Using the guidelines, rubrics and forms from the website, review and provide recommendations concerning the appropriateness of use in the following areas: 1. Web site evaluation for handicap access; 2. Software evaluation; 3. Hardware evaluation and;4. Ability evaluation
Field/Experimental Experiences - 1. Assistive hearing; 2. DVD experience; 3. Voice input/control; 4. Memo minder and; 5. Environmental control
Activities - 1. IEPs - TREE software: Use software in the process of creating an individualized education plan that incorporates assistive technology; 2.Create a communication board: Design and produce a one-page document to act as a communication board specific to subject area and grade level. The board should provide words and icons that are representative of speech necessary for discussion/communication for a class in that area; 3. Concept mapping: Using concept map software as a learning tool, develop an application for studying and learning.

Other Assessments - 1.Quiz on legal/support/IEP; 2. Forum discussions; 3. Case studies and; 4. Site experience/observation (assistive technology in a classroom or demonstration lab)

During the early part of the course, you should arrange to visit a class and observe a student using assistive technology devices. The class can be self-contained or mainstreamed. Use the assistive technology device checklist and then provide a summary of your finding concerning the student. You should make mention of how the student and teacher feels concerning the technology. If you would prefer not to visit a class or am unable to make sufficient contacts to be able to do so, the following are acceptable alternatives to classroom observations:

Visit an ATEN lab
Attend a ATEN workshop
Attend a FDLRS (or equivalent) meeting or workshop
Visit a FDLRS (or equivalent) lab displaying assistive devices

Evaluation: Course grades are based on quizzes, activities, projects and lab assignments.

Target Learners: Current and future educators, instructional technologists, and anyone interested in learning about assistive technology for the school setting. This course may be applied to recertification at all grades and subject areas.

Forming Personnel, Creating Culture. Participative System for Preparing Content Providers for Homepages Addressed to People with Special Needs.

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Abstract: Our work is developing a homepage, content providers for and with people with special needs in a continuously evolving, participatory system. Our purposes are: qualifying technicians in Special Education, building, feeding and managing a site in the Web; developing a culture of the computer usage as a mediator of communication. We took into account the following directives: being flexible, modular, so that, new participants may always be integrated; looking for accessibility resources both for the production of the homepage and the qualification of the work team; decentralizing the production of the homepage form and content, and keeping a permanent channel for guidance of the participants; associating the qualification's content with its use in making the homepage; guaranteeing the work team's autonomy in keeping and improving the homepage. A preliminary graphic proposal is online to be analyzed and criticized to reach a better visual and sound promotion of the hypertext components.

Introduction

Our challenge is to develop a homepage for and with people with special needs. That means a collective work, continuously evolving, to create a participative system for preparing content providers for homepages addressed to people with special needs, as requested by the "Diretoria de Educação Especial" (Bureau of Special Education) of the "Secretaria de Educação do Estado de Pernambuco" (Department of Education of Pernambuco State).

To carry out that conception with the most positive results in number of accesses, and able to become an institutional undertaking out of the groups of participants' sphere of management, some directives have been suggested and implemented, making up a system of production. Such system of production is the project main body, and has as principle the idea of collective production of a homepage that works organically connected to the political-pedagogical conceptions of the requesting Bureau, so as to assure a real acquisition of this

instrument of work through developing conceptions and basic competence for the homepage future maintenance by the work team members.

Together with technicians and support educators, the work team defined the purposes:

1. To build a homepage addressed to people with special needs.
2. To qualify technicians in Special Education, for building, feeding and managing a site in the World Wide Web;
3. To develop a culture of the computer usage as a mediator of communication.

In order to put our work in practice we have regular meetings. This is the way we work for defining the target clients, the themes to compound the site, their nomenclature and hierarchy, have been developed, carried on through assigned tasks, discussions, records, researches on the Web, and qualification in concepts applied to the homepage production. On the [Table 1] we give an example on how the people involved in the project share the tasks.

Stages	**Personnel Engaged**		
	Work Group	***Consultants***	***Technicians in Informatics***
1 Conceptual design	Defining client Surveying needs Defining institutional representation	Supplying subsidies Systematizing.	
2 Contents	Defining Collecting Mapping	Supplying subsidies Systematizing Mapping	Mounting Digitizing
3 Graphic Design	Following up Appraising		Implementing
4 Animation / Updating	Following up Implementing	Assisting	Casual Action

Table 1: Division of working tasks among personal

Indeed, it has been established a process which does not end with the conclusion of the making of the homepage. An executive plan corresponding with the circumstances and characteristics of the group, the target public and even the requesting Bureau has been developed, taking into account the following directives:

a) To be flexible, modular, so that, new participants may always be integrated;
b) To look for accessibility resources both for the production of the homepage and the qualification of the work team;
c) To decentralize the production of the homepage form and content, and keep permanents channel for guidance of the participants;
d) To associate the qualification's content with its use in making the homepage, so as to invert the equation of outer, closed production into an inner, open one;
e) To guarantee the work team's autonomy in keeping and improving the homepage.

A process of qualification has been established, of which the practical result is the homepage development, which has been divided into six moments. Those moments consider the formalization of three component contents: 1) Web conceptions. 2) Formal Design and hypermedia, and 3) Computer and software usage. In the graphic Design and hypermedia case, the qualification has been only preliminary.

The members of the working team participate in all steps of the homepage construction.

Besides qualifying people with the necessary technical requirements to create and manage their own homepage, an important outcome is the feeling of command developed by the team, that may be understood from the methodology of work that has been built, as follows:

Definition of a methodology of work: collectively building this instrument, through researches, meetings, discussions, studies, use of computers.

Break of some paradigms: the knowledge of Informatics, seen before as a basic requirement for making a homepage, has been acquired little by little, in exchanges in the group, and according as the page contents and their form of organization are dimensioned.

Some discoveries: the challenge and the value of a collective construction, the possibility of approaching the school to other segments of society, the feeling of responsibility before that product that is the group's creation,

the decentralization in the management of a homepage, the acquisition of knowledge of projects, laws, entities and professionals of the area.

After organizing the site into topics from a vertical list, the group of participants built a model of organizational hierarchy [see Figure 1], in which the information could be linked through association, allowing, in a later stage, to incorporate, remove, fuse or separate the group of information, in a hierarchy discussed and defined by themselves.

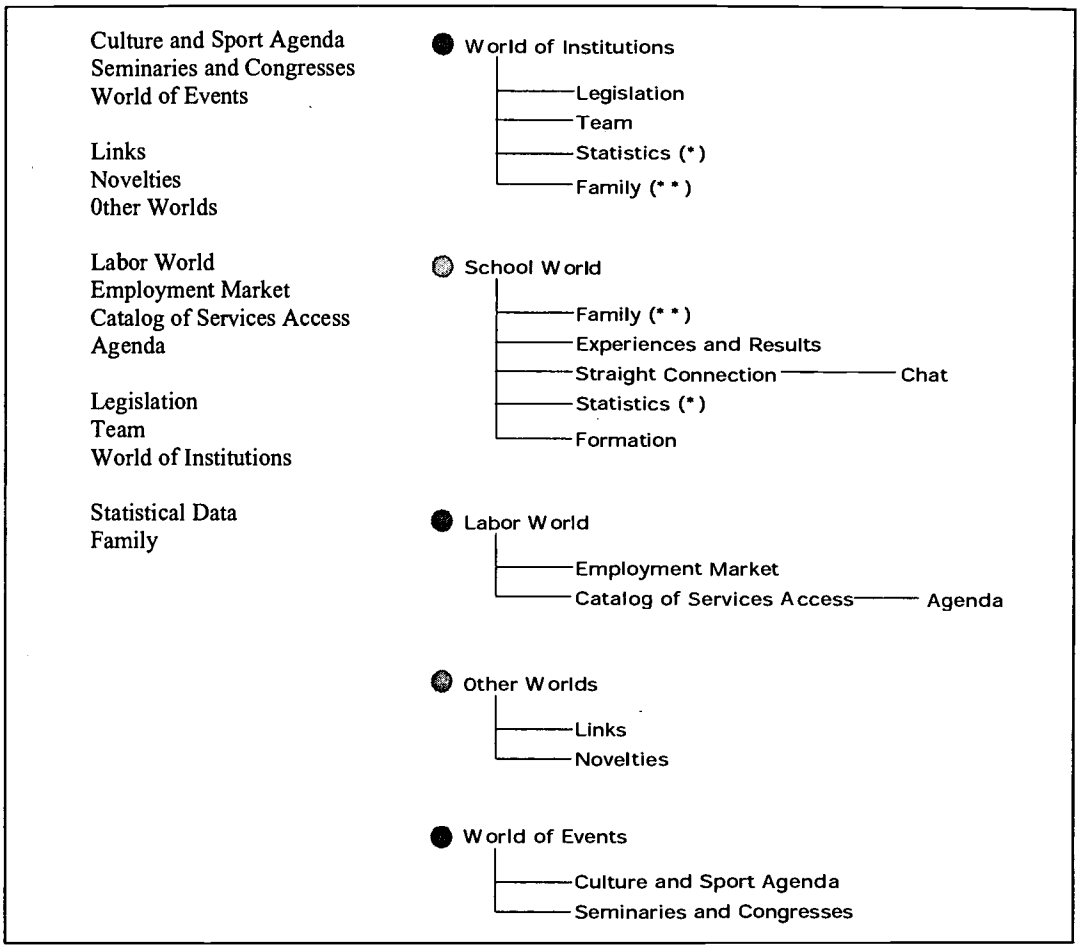

Figure 1: Organizational Structure

The result was a substantially different division, yet keeping the characteristics of a hypertextual organization.

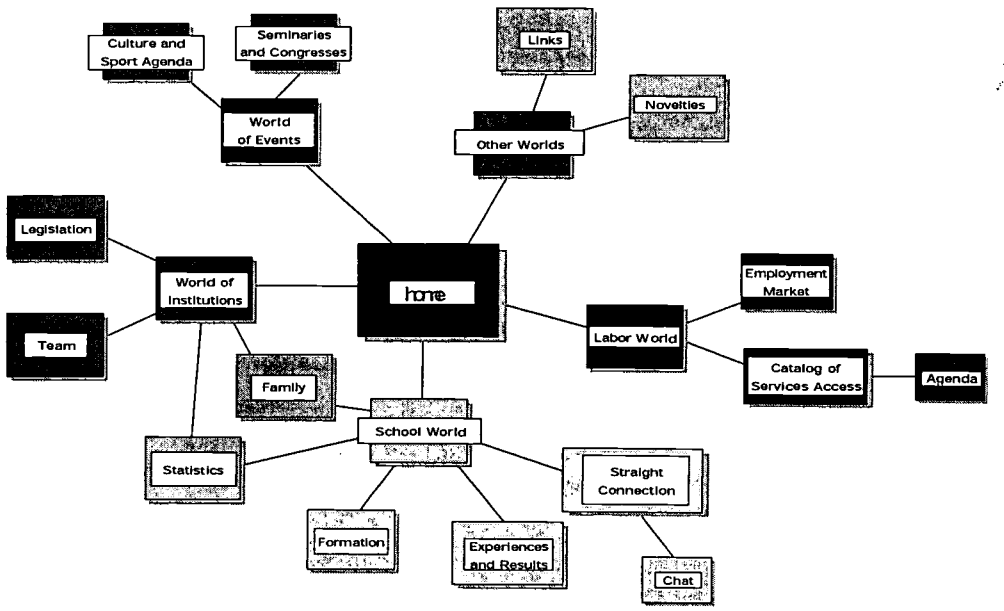

Figure 2: Site Structure

At present the participants have initiated their activities of exchanging e-mails, as well as collecting information to fill the page. A preliminary graphic proposal has been presented, with a purpose equivalent to that of the hierarchy proposal: to encourage the participants to develop their own interface. The model presented has been analyzed and criticized. Now, a work is in progress for a better visual and sound promotion of the hypertext components [Figure 3].

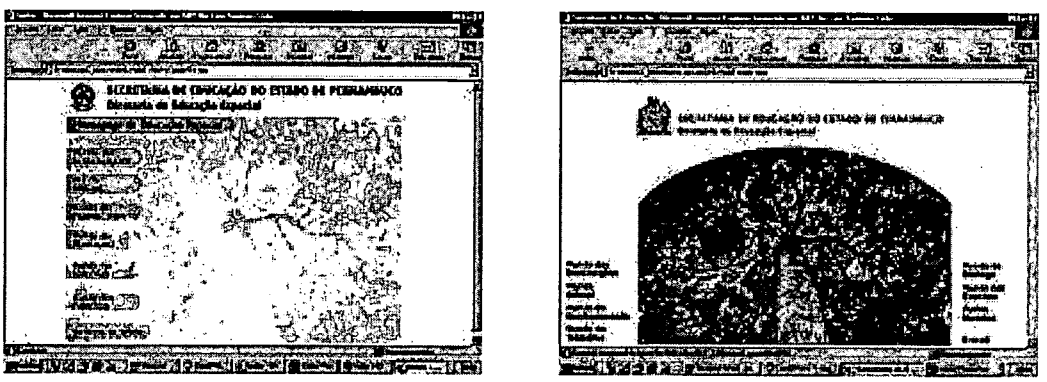

Figure 3: Visual changes at the homepage.

At the same time, the participants began to define a system of propagating the information: each participant will become a potential trainer of other groups.

That model proposes that interrelated associations be formed to feed not only the homepage, but also to provide content for other sites, and to continue to encourage the creation of a culture of computers' usage as mediator of communication both of people with special needs and of those who work with them.

Homepage is hypertext, representing the possibility of rapid examination of the content, of non-linear and selective access to the text, of segmentation of knowledge into modules, and of multiple connections with innumerable other hypertexts. It represents "one of the futures of the writing and reading" (Levy, 1993, p.19).

Communication will be neither the message, nor the sender, nor the receiver, but the hypertext, which "is like an ecological reserve, the ever movable system of the senses' relation that the precedent ones keep" (Levy, 1993, p.73). It is from that perspective that a new culture of communication is being created to whom is in need of special resources to get into communication.

Our role is to make people literate in Informatics, in the "Freirian" sense of the term (Jurema and O'Rourke, 1997), so assuring a real appropriation of those changes, through the development of concepts and basic competence for the future maintenance of the homepage by the participants of the working team.

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PREPARATION OF EDUCATORS TO PROVIDE EFFECTIVE COMPUTER-BASED ASSISTIVE TECHNOLOGY ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

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Abstract: As students with disabilities are mainstreamed into general education settings, teachers need to be knowledgeable about appropriate accommodations, formats, and strategies, as well as accessibility issues. Often educators feel overwhelmed by the need to develop and deliver individually effective instructional materials for students with diverse abilities. This is particularly true in light of the current emphasis upon computer-based assistive technology as well as the need to make the Internet accessible as a learning tool for students with disabilities. There are no specific training competencies for general educators relative to assistive technology or Internet accessibility for students who require accommodations. Based on the emerging literature in this area, a qualitative study was conducted to determine the experiences and needs of teachers in this domain. A series of open-ended questions were used in an interview format. A subsequent analysis of transcribed interviews yielded patterns of teacher responses that will be discussed in terms of implications for training.

BACKGROUND

Traditionally, teachers working with students who had disabilities utilized various instructional methods to enhance student learning as well as formats that included large print or audio cassette versions of print materials for individuals with impaired vision or augmentative hearing devices for individuals with hearing impairment. However in the past five years, many of the accommodations that are necessary for students with disabilities include sophisticated computer-based assistive technology. Furthermore, teachers who utilize the Internet for class assignments must develop strategies to make this complex learning tool accessible across students who may have very different learning abilities.

THE CONTEMPORARY CHALLENGE OF COMPUTER-BASED ASSISTIVE TECHNOLOGY

Today, teachers working with students who have disabilities must expand their repertoireof accommodation formats, strategies, and accessibility issues relative to (a) computer-based assistive technology and (b) the use of the Internet as an instructional tool. Some examples of computer-based assistive technology materials for students with various abilities and disabilities include visual signals in addition to auditory signals, "Close View" screen enlargement programs, voice recognition systems for voice access to computers, adaptive software programs (including word prediction programs for word processing with limited key strokes), specialized keyboards (on-screen keyboards, large keyboards for individuals with limited motor control, or miniature keyboards for individuals with motor impairment), alternative input devices (joysticks and trackballs), and alternative output devices such as large-text or Braille printers (Lisiecki, 1999; Menlove & Hammond, 1998). For students with learning disabilities,

assistive technology accommodations may consist of reading machines, word processors, and other educational software that can compensate for reading, mathematics, writing, and spelling difficulties (Bryant, Bryant & Raskind, 1998). Finally, issues of Web accessibility for students with various disabilities remains a challenge for most classroom teachers.

TEACHER TRAINING NEEDS

A teacher's ability, training, and attitude regarding computer-based assistive technology and Web access are major contributors to a student's success. Given the emphasis upon mainstreaming of students with disabilities into general education classrooms coupled with the shortage of special educators for support and consultation, general education teachers are in need of training to support access for all of their students. Based on the emerging literature on the subject of computer-based technology and Web accessibility, a qualitative study was conducted to determine the needs and experiences of preservice and inservice general education teachers in these areas. A series of open-ended interview and survey questions were developed. Undergraduate teacher education students as well as licensed teachers and teacher education faculty responded to the questions. Questions focused upon individual attitudes, knowledge, and skills regarding assistive technology and Internet accessibility. Audiotaped interviews were transcribed and analyzed in order to develop a taxonomy of emerging patterns of practitioner experiences and training needs.

RESULTS AND IMPLICATIONS

The emerging results of this project can be broadly categorized into teachers' attitudes about special education, teachers' attitudes about technology, teachers' lack of confidence in terms of their knowledge base regarding computer-assisted accommodations, a lack of funding and resources to implement appropriate computer-based accommodations, and overall unfamiliarity with the issue of Internet accessibility for students with disabilities. As reported by McGregor & Pachuski (1996), as well as Persichitte, Caffarella & Tharp (1999), teachers in general are very concerned about the rapid pace of development of education technology coupled with new applications of classroom instruction. This concern is amplified by the reports of the teachers in this study who work with students who have disabilities. One of the on-going goals of this study, and of this presentation, will be to expand the implications of teacher attitudes and experiences into a discussion of the specific core competencies (as initially addressed by Lahm and Nickels, 1999) that would be necessary for general education as well as special education teacher training programs.

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Website 101: Creating Annotated Special Education Bibliotherapy with Children's and Young Adults Books

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Abstract: The purpose of this project is to share the steps involved in creating and designing a specialized web site for viewers who either work with children and young adults who have special needs or those who have special needs. The web site will allow the viewers to apply the principles of bibliotherapy. Bibliotherapy is defined as healing through books, reading books to help solve and better understand personal problems, and/or mutual sharing of literature in order to structure interaction between a facilitator and a participant. The web site, designed to be interactive, becomes the facilitator and the viewers become the active participants. For example, people may log on and write reflections about their feelings toward the book listed on the web site. Participation in bibliotherapeutic intervention allows participants to hyperlink with other viewers, and therefore, make connections that encourage active problem solving related to special needs.

Project Description

The authors discovered that there is no an interactive web site on bibliotherapy that utilizes current children's and young adult books. This paper describes a project designed to help participants select books whose topics relate to the problems of people with special needs. Since the web site is interactive, participants can read a recommended selection and post their written responses to an interactive bulletin board. Initial categories were chosen based on special needs frequently reported in the literature (see Table 1), with the understanding that other categories would be added at a later date, including death and dying, less common disabilities, etc.

1LT Leo Brennan, an undergraduate in Multimedia Design at Cameron University, assisted with the creation of an interactive web site containing links to each of these special needs. These web design features were taken into consideration: background, color, imaging (animation and graphics), FAQs, links to other sites on the Internet (authors' homepages, other reviews, etc.), WebCT format, accessibility, server issues (file transfer, testing, publicizing and maintaining the site), sound clips, format for book reviews, alternative text, alignment, embedded tables. Publishers were contacted and asked to submit books that fit the specific categories presented in the following table.

Table 1

Special Needs Categories Included in Bibliotherapy Web Site

Abuse	ADHD (Attention Deficit Hyperactivity Disorder)	Autism	Behavior Disorders
Chemical Dependancy	Communication Disorders	Dysgraphia	Dyslexia
Emotional Disturbance	Fetal Alcohol Syndrome	General and Multiple Disorders	Gifted and Talented
Hearing Disabilities	Learning Disabilities (spelling, math, reading, writing)	Mental Retardation	OHI (Other Health Impaired)
Physical Disabilities	TBI (Traumatic Brain Injury)	Vision Disorders	To be developed

Table 1: Bibliotherapy special needs books

Outcomes

Current books were identified that speak to specific special needs. Certain books were chosen repeatedly, which is indicative of the bibliotherapeutic value and literacy merit. In addition, this study also reflects the level of interest of the participants, which is considered one indication of personal need. An innovative web site has been created for use by people (professionals, librarians, empathetic readers, victims and their families) that provides healing through books.

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Integrating Technology in Classrooms with Learning Disabled Students: Teachers' Needs and Professional Development Implications

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Abstract : Although technology could have a positive impact on students with learning disabilities, it appears that special education teachers do not use these teaching and learning tools to their full potential. This paper presents the main findings of a survey on special education teachers' use of technology and their needs regarding technology integration. Results from the survey show that although teachers have a favourable opinion on technology, intensive computer use in the classroom remains scarce. Lack of time, insufficient knowledge of the pedagogical uses of technology and lack of information on existing software were identified as the three major hurdles to technology integration. Considering these needs, professional development activities should aim to provide a greater knowledge of the pedagogical strategies suited to use different technologies, develop teachers' skills for technology-based activity planning and give teachers the means to share information on available educational material.

Introduction

Many studies and meta-analysis highlight the benefits of computer applications in an educational setting. Although, as pointed out by Woodward and Rieth (1997), results from such studies are not easy to interpret given the different applications, design characteristics or instructional strategy they may imply, it appears that technology can have a positive effect on learning in different contexts (Sivin-Kachala & Bialo, 1994; Johnson, Cox et Watson, 1994; Hannafin, Hannafin, Hooper, Reiber et Kini, 1996) and on student motivation (Sivin-Kachala & Bialo, 1994; Draude et Brace, 1999).

Technology could even have a greater impact on learning for students with learning disabilities. Sitko and Sitko (1996) concluded from different studies that motivational and affective benefits derived from technology uses are more conspicuous for students with special needs. Furthermore, Bender and Bender

(1996) mentioned that certain computer attributes can help palliate some characteristics of students with learning disabilities. For instance, graphics and sound can help create interest when students show a general lack of interest towards educational material and frequent reinforcement can increase their short attention span. Green (1995), after interviewing teachers known for their extensive experience with computers and students with learning disabilities, concluded that multimedia computer software increases motivation and self-esteem for many learning disabled students and, in some cases, reduced behaviour problems.

Despite these potential benefits, there is little evidence that teachers use these technological tools on a regular basis with learning disabled students. In a report on computer use in special education, Chouinard (1996) stated that access to computers in special education classes in Quebec was limited and that special education teachers did not use technology on a regular basis with their students. Since then, very little research data have been published on the extent and nature of computer use in special education, in Quebec or elsewhere.

Special education teachers seem to use only a few of the technological tools available. Prinz and Boger-Mehal (1999) stated that the use of technology within special education classrooms is often limited to rote practices using games or to tasks such as word processing and drawing. Based on our field experience, it seems that few classroom experiences allow learning disabled students to engage in long-term projects using technology as a production tool although such projects may have a positive impact on these students. These observations lead us to believe that computers are not used to their full potential in the special education classroom.

This paper relates to a three-year collaborative research project focusing on the integration of technology in classrooms with learning disabled students and the effects of this integration on student motivation, self esteem and social abilities. The project was conducted in various schools from three distinct Quebec school boards. The main objectives of the project were as follows:
- To assess teacher use of technology in classrooms with learning disabled students and identify their needs in regard to technology integration;
- To develop, in collaboration with teachers, instructional activities where students carry out a project using technological tools;
- To assess the impact of technology integration on student motivation, self-esteem and social abilities.

This paper focuses on the first two objectives, since the impact assessment is not yet completed. After highlighting the principal uses of the computer in the classroom, it will describe teachers' needs in regard to technology integration. Then, it will make some recommendations for inservice teacher professional development, taking into account some of the survey results related to computer uses and teachers' needs. It also presents a model for classroom projects engaging learning disabled students in long-term activities.

Method

202 teachers from different Quebec schools working with elementary and high school students with learning disabilities or behaviour problems were asked to complete a questionnaire focusing mainly on their use of technology both inside and outside the classroom, on their attitude toward technology and on the obstacles and their needs regarding technology integration in their own classroom. Some data were also collected on teacher characteristics, experience with technology and computer access in the school. The 42 item questionnaire used a mix of Likert scale type and open-ended questions.

Interviews conducted with 43 of these teachers supplied in-depth information on the obstacles to technology integration and on the measures that could help teachers attain this integration. Interviews were conducted using a semi-structured approach.

In the second year of the project, nine elementary and high school teachers were selected to experience in their classroom different long-term projects integrating computer activities. Projects were planned jointly by research team and teachers.

Main Results

Results from the survey showed that computers are available to nearly all teachers and that more than 80% of teachers used the computer for personal and professional use outside the classroom. Teachers' attitude toward computers are also very positive, as 89% of teachers consider that technology is useful for teaching and learning and 81% of them think it should be used in the classroom. Most of them (78%) also consider that technology has a positive impact on student learning.

Despite the relative accessibility of the computer and teachers' favourable opinion toward technology, actual use in the classrooms is not very extensive: 25% of teachers don't use the computer in the classroom and no more than 29% of them use it more than two hours a week with their students. Furthermore, when computers are used in the classroom, it is usually for word processor, educational software or Internet use. These applications are the only ones used on a regular basis by more than 20% of teachers.

In order to better understand the discrepancy between teachers' positive attitude towards technology and their relatively limited use of the computer in the classroom, it is logical to investigate the obstacles identified by teachers as the main hurdles to technology integration in the classroom. Lack of time, insufficient knowledge of the pedagogical uses of technology and lack of information on existing software were identified as the three major obstacles to technology integration. A majority of teachers are satisfied with the quality of the hardware available (82%) and the technical support supplied in the school. On the other hand, 47% of teachers are not satisfied with the pedagogical support they receive to integrate technology. More than half of the teachers (55%) consider that they don't get enough information on technology relating to educational applications.

The training needs expressed by most teachers focused on the strategies to implement in order to use technology in a sound pedagogical manner. The teachers identified greater needs relating to the pedagogical aspects than the technical aspects. Over 90% of teachers consider that training on appropriate teaching strategies for technology-based classroom activities would be useful. Access to computers or suitability of the available computers did not seem to be a major obstacle for most teachers although some mentioned that they would like to have more computers in their classroom.

These results are in agreement with the opinion of Cuban (1993) who argues that logistical difficulties or lack of funds form only a partial explanation of a deeper problem related to the underuse of technology in schools. A discrepancy between sound pedagogical use of technology and core visions of teaching represent also an important issue in technology integration.

Implications of the Study

Taking these results into account, we can suggest ways to meet some of the teachers' needs, in order to facilitate technology integration in the special education classroom. Considering these needs, professional development activities should aim to provide a greater knowledge of the pedagogical strategies suited for different technology uses, develop teachers' skills for technology-based activity planning and give teachers the means to share information on available educational material. The following suggestions could help reach these goals.

- Create networks where teachers can share information and discuss different classroom technology integration experiences.

Since a majority of teachers expressed dissatisfaction toward the information available on technology applications in their school, networks where teachers can exchange information on technology-based activities seems useful. Such networks could facilitate the sharing of experiences and material well suited to the curriculum.

- Focus on the pedagogical strategies needed when using technology rather than on more technical aspects. As pointed out in our study, teachers' needs and concerns are closely related to pedagogical aspects. Consequently, teacher education programs and training should focus on the strategies to implement in technology-based activities. Proposing models for classroom activities and helping teachers develop their own activity scenarios can contribute in developing competencies in the use of sound pedagogical strategies in computer-based activities.

- Give training on a wide variety of technology uses in special education.
As pinpointed by our study and by other authors such as Prinz & Boger-Mehal (1999), special education teachers only use a few of the technological tools available. As does Bailey (1992), we believe it is necessary to expand the options for computer use in special education in order to empower the teachers to use a wider variety of these tools with their students.

-Prepare teachers to guide their students towards long-term projects.
As shown by our study, few special education teachers engaged their students in long-term project integrating technology. Most often, they proposed short-term activities such as instructional games. Because special education students often learn at a slower rate and have a long history of failure, long-term projects may be more suited to produce significant changes. Furthermore, engaging students in projects where computers are used as a tool to gather information and create their own productions allows the students to perform activities that are more significant.

The projects developed with nine teachers suggests different models for classroom activities engaging students in long-term projects where computers are used as a tool. For example, in one of these models teachers guide students through the following steps:

- Define a goal and topics
As learning disabled students often lack motivation toward classroom activities, it is important to let them participate in the choice of the project and the related topics. The goal should have meaning for the students.

-Get direct experience or expert testimony related to the project
Real life experience or others' testimony appears to be a good way of engaging the students in the project and heightening interest .

-Gather relevant information via electronic sources
By gathering information from different sources, students can widen the scope of their inquiry and improve the quality of the final result. Teacher supervision appears important to help students improve their inquiry strategies and guide them toward relevant materials.

- Create a collective product using electronic tools (journal, multimedia document, database or other)
Learning disabled students can take pride in authoring their own media productions. Technology as a production tool also provides some advantages for students with learning disabilities. As Woodward and Rieth (1997) mentioned, tools such as word processors eliminate the problems associated with poor writing skills encountered by a lot of learning disabled students. When used with relevant learning strategies, the computer can support the planning, writing and revision phases of product execution (MacArthur, 1997). The collective aspect of the project should take into account the strengths and weaknesses of the different students.

-Present their production in and outside the classroom
Learning disabled students' productions are rarely displayed. Assuring a distribution of their work both inside and outside the classroom can contribute to increase their self-esteem and to create a positive effect on others' perceptions.

This model can be illustrated with examples drawn from the experiences carried out during the past two years in different elementary and high school level classrooms.

More information on this project and its results is available (in French only) at the following Website: http://www.uqtr.uquebec.ca/gritas

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The Integration of Assistive and Adaptive Technologies Into the Preservice and Advanced-Level Courses of Instructional Technology and Special Education

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Abstract: Instructional technology has become a tool that is integral to the preservice teacher educators' bag of tricks; however, the integration of assistive and adaptive technologies into the learning environment to meet the needs of special education learners is sometimes perceived as more cumbersome. The integration of assistive and adaptive technologies into the preservice and advanced-level instructional technology courses is discussed.

Introduction

Personnel preparation may be defined as providing the knowledge and skills related to effective educational and related services based on best practice and changing trends for educators to teach all students (Ryndak & Sirvis, 1999). Utilizing these knowledge and skills to provide a supportive learning environment has become the basis for evaluation of an educator's ability to address the individualized needs of each student. While Special Education faculty assume the role of content experts for the assessment, selection, implementation, and evaluation of assistive and adaptive technologies, Instructional Technology faculty play the role of process experts in "the design, utilization, management and evaluation of the processes and resources for learning" (Seels & Richey, 1994, p. 1).

Instructional Technology

Instructional technology is a tool that preservice teachers must begin to conceptualize throughout focused methods course work. The introductory technology course offered at numerous universities addresses knowledge and skills related to an understanding of instructional technology, theoretical implications, appropriate and successful applications within the learner-centered environment, appropriate integration of technology within lesson plan design and development as well as numerous other instances of instructional application of technology. However, situations occur that may be beyond the experiential scope of presevice teachers. For example, how does a teacher work with a student who has specific learning needs, such as a student receiving special education services? Instructional technology offers the special education learner the opportunity to work alongside other students in an on-level classroom environment. For many preservice teachers, the opportunity for early hands-on experience with assistive/adaptive technologies is not available within the traditional beginning education course work. Rather it occurs in later field experience courses.

Instructional Technology and Special Education

The teaming of Special Education faculty and Instructional Technology faculty provides an innovative formula to address the issue of assistive and adaptive technologies within preservice- and advanced-level courses associated with instructional technology and special education. While Special Education faculty have brought their knowledge of assistive and adaptive technologies to the table, Instructional Technologists have brought their expertise concerning the appropriate and successful integration of technologies into the educational learning environment. In this way, the preservice teacher educators have the opportunity not only to learn about assistive and adaptive technologies, but also to focus upon the integration of such technologies within a supportive learner-centered environment for special education PreK-12 students.

Special Education

Special Education provides technology-embedded course assignments and activities. The technology process activity provides preservice teachers with information needed to complete course assignments related to case study students. Examples of embedded technology include the use of instructional strategies requiring informational websites, e-mail, database searches and electronic libraries. Examples include the preservice teachers' use of technology to: research disability areas; develop a website "Resource Directory of Services" for young children with disabilities and their families; create on the computer original artistic interpretations and schematics; read what family members of students with disabilities say on discussion boards; participate in an interactive video workshop on assistive and adaptive technologies and universal design; visit virtual classrooms using assistive and adaptive technologies; browse vendor websites for assistive and adaptive technologies; download and use sample software programs; complete on-line surveys; create communication boards using Mayer-Johnson Inc. Boardmaker software; and design, develop and present Microsoft PowerPoint presentations,.

Through the use of technology-embedded special education course work, preservice teachers become knowledgeable in the numerous ways technology can be integrated into services for special education students. Technology-embedded course work provides a link between the successful application of technology and the provision of a supportive learner-centered environment for special education students. In this way, the educator not only meets the special needs of each student but also provides the student with an opportunity for success in the general education setting. Instructional technology offers the special education student this opportunity, wherein the learning environment is not only student-centered, but centered upon student success.

Conclusions

Through the integration of assistive and adaptive technologies into the preservice and advanced-level courses of instructional technology and special education, the preservice teacher educators' bag of tricks has expanded. Such powerful tools within a learning environment offer numerous directions through which to reach special education students and to adapt the learning environment to the students' needs. The importance of appropriate, thoughtful and successful integration of technology within a special education environment must be emphasized through out the preservice teacher educators' program of study.

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Designing Accessible Web Sites for People with Disabilities

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Abstract

In order to make the Worldwide Web accessible to individuals with disabilities and also more accessible for everyone, web developers can follow 14 guidelines provided by the W3C group. This paper summarizes these guidelines and provides suggestions for compliance. Levels of compliance, benefits of compliance, examples of accessible web sites, and an accessible web site template are described.

The Web is a democratic media that is designed to provide information not only anytime and anywhere but also for everyone. For those unfamiliar with accessibility issues pertaining to Web page design, consider that some users may be operating in contexts very different from your own. For example:

- They may not be able to see or hear.
- They may not be to process some types of information (written, visual, auditory) easily or at all.
- They may have limited ability or no ability to move or manipulate a keyboard or a mouse.
- They may have difficulty reading or comprehending text.

Individuals also sometimes use supplementary software programs and devices, called **assistive technologies**, which aid them using technology. Assistive technologies include specialized web browser programs and screen reader programs. Web developers should consider access for individuals with disabilities and their use of assistive technologies during site design. While there are several disabilities to consider, each accessible design choice generally benefits several disability groups at once and the Web community as a whole.
The **W3C group**, a nonprofit organization, has produced a set of fourteen *Web Content Accessibility Guidelines* which are available online (W3C, 2000). A consortium of government agencies and businesses sponsors W3C. Its goal is to increase web accessibility.

Priorities for Accessibility

The W3C guidelines provide general principles for accessible design. Each guideline has a priority level assigned to it based on its impact on accessibility. These priorities are described below:

- Priority 1: Requirements which developers must address

All sites must comply with these requirements or else one or more groups will find it impossible to access information in the document.

- Priority 2: Requirements which developers should address

All sites should satisfy these guidelines. Otherwise, one or more groups will find it difficult or impossible to access information in the document.

- Priority 3: Requirements which developers may address

These are requirements which Web developers may address to improve access to web documents.

Sites that conform to the W3C guidelines may display the image or message shown below as an indication of conformance on their web page:

The W3C Approved Web Site Image

This page conforms to W3C's "Web Content Accessibility Guidelines 1.0", available at http://www.w3.org/TR/1999/WAI-WEBCONTENT-19990505, level Double-A.

The level of compliance is indicated as A, AA, or AAA as described below:

- Conformance Level "A": all Priority 1 checkpoints are satisfied,
- Conformance Level "Double-A": all Priority 1 and 2 checkpoints are satisfied,
- Conformance Level "Triple-A": all Priority 1, 2, and 3 checkpoints are satisfied.

Guidelines for Web Accessibility

The W3C Level guidelines are summarized below.

Guideline 1: Provide equivalents to auditory and visual content.

For each graphic image, text content can be presented to the user as text. In order to be useful, the text must convey the same function or purpose as the image. For example, consider a text equivalent for a photographic image of the Earth as seen from outer space. If the purpose of the image is mostly that of decoration, then the text "Photograph of the Earth as seen from outer space" might fulfill the necessary function. If the purpose of the photograph is to illustrate specific information about world geography, then the text equivalent should convey that specific information. If the photograph has been designed to tell the user to select the image (e.g., by clicking on it) for information about the earth, equivalent text would be "Information about the Earth". Thus, if the text conveys the same function or purpose for the user with a disability as the image does for other users, then it can be considered a text equivalent. This is probably the easiest modification that can be made to most Web pages to make them more accessible. Most web authoring programs, such as *Microsoft Front Page*, have a function called *Alternate* that can be used to enter a text description for images when they are placed on a page. When the user moves the cursor over the image, a text equivalent for the image will then appear on the user's screen.

Non-text equivalents of text such as icons, pictures, pre-recorded speech, or a video of a person translating the text into sign language can make documents accessible to people who may have difficulty accessing written text, including many individuals with cognitive disabilities, learning disabilities, and deafness. Non-text equivalents of text can also be helpful to non-readers. An auditory description is an example of a non-text equivalent of visual information. Auditory descriptions of multimedia presentation's visual track benefits people who cannot see the visual information. Audio can be recorded with application programs such as *RealAudio* and added to the web page as an option.

Guideline 2: Don't rely on one color alone.

Ensure that text and graphics are understandable when viewed without color. If color alone is used to convey information, people who cannot differentiate between certain colors and users with devices that have non-color or non-visual displays will not receive the information. When foreground and background colors are too close to the same hue, they may not provide sufficient contrast when viewed using monochrome displays or by people with color deficits.

Guideline 3: Use markup and style sheets properly.

Using html markup improperly hinders accessibility. Misusing html markup for a presentation effect, such as using a table for a page layout or a header to change the font size, makes it difficult for users with specialized software or hardware to understand the organization of the page or to navigate through it. Constructing what looks like a table of data with an HTML PRE element makes it difficult to render a page intelligibly to other devices.

At the other extreme, Web developers should not sacrifice appropriate formatting because a certain browser or assistive technology does not process it correctly. For example, it is appropriate to use the TABLE element in HTML for tabular information even though some older screen readers may not handle side-by-side text correctly.

Guideline 4: Clarify natural language usage.

Use text enhancements, such as boldface and italic, when they facilitate pronunciation or interpretation of abbreviated or foreign text. Developers should also provide expansions of abbreviations and acronyms. Using natural language improves readability of the Web for all people, including those with learning disabilities, cognitive disabilities, or people who are deaf. When abbreviations and natural language changes are not identified, they may be indecipherable when machine-spoken or brailled.

Guideline 5: Create tables that transform gracefully.

Tables should be used for tabular information (data tables) only. Developers should avoid using them to design page layouts. Tables for any use present special problems to users of screen readers. **Screen readers** are software applications commonly used by visually impaired individuals to read the text on a screen aloud so that it can be heard.

Guideline 6: Ensure that pages featuring new technologies transform gracefully

Ensure that pages are accessible even when newer technologies are not supported or are turned off. Although developers are encouraged to use new technologies that solve problems raised by existing technologies, they should know how to make their pages still work for people who choose to turn off features. Ensure that pages require scripts, applets, or other programmatic objects can be turned off or not used. If this is not possible, provide equivalent information on an alternative accessible page.

Guideline 7: Ensure user control of timed content changes.

Ensure that moving, blinking, scrolling, or auto-updating objects, if used, may be paused or stopped. Some people with cognitive or visual disabilities are unable to read moving text quickly enough or at all. Movement can also cause such a distraction that the rest of the page becomes unreadable for people with cognitive disabilities. Screen reader programs are also unable to read moving text.

Guideline 8: Ensure direct accessibility of embedded user interfaces.

Objects embedded in pages, such as applets and scripts, sometimes have their own interface. In these cases, the interface should be accessible to users so that they can be adapted to work with assistive technologies if necessary. If the interface of the embedded object cannot be made accessible, an alternative accessible solution, such as an alternate version of the page, should be provided.

Guideline 9: Design for device independence.

Device-independent access means that the user may interact with the site or document with a preferred input or output device such as a mouse, keyboard, voice, head wand, or other device. If, for example, control of a form can only be activated with a mouse or other pointing device, individuals using voice input, a keyboard or some other non-pointing input device will not be able to use the form.

Guideline 10: Use interim accessibility solutions so that assistive technologies will operate correctly.

New web technologies may not be immediately available to people using assistive devises. For example, older screen readers read lists of consecutive links as one link. Active page elements such as this are therefore difficult or impossible for these users to access. Also, changing the current window or popping up new windows can be very disorienting to users who cannot see that this has happened. This guideline is classified as "interim", meaning that the Web Content Guidelines Working Group considers them to be valid and necessary to Web accessibility as of the publication of the current version of the guidelines. However, the Working Group does not expect this to be necessary in the future, once Web technologies have incorporated anticipated features or capabilities. Until all browsers allow users to turn off spawned windows, developers should not cause pop-ups or other windows to appear or change a current window without informing the user.

Guideline 11: Use W3C technologies and guidelines.

Many formats commonly used on the web such as *PDF, PostScript* and *Shockwave*, require viewing with either plug-ins or stand-alone applications. Often, these formats cannot be viewed or navigated with the assistive technologies in common use. W3C recommends that these document formats be converted to W3C supported markup languages such as HTML, XML, or plain text. When inaccessible technologies must be used, equivalent accessible pages should be provided.

Guideline 12: Provide context and orientation information to help users understand complex pages or elements.

Providing navigation tools and orientation information in pages will maximize accessibility and usability. Not all users can make use of visual clues such as image maps, proportional scroll bars, side-by-side frames, or graphics that guide sighted users of graphical desktop browsers. Orientation information is somewhat like the running head of a book and tells the user where she is in the web site. For example, a web page might include an orientation line in the footer of the page that reads something like *Introduction: page 2 of 6*. This tells the user what part of the web site they are viewing. Simple icons such as a home icon and forward and back arrows also improve the ease of navigation. Grouping page components and providing contextual information about their relationships can be useful for all users. Dividing large blocks of information into more manageable groups where natural and appropriate also aids in understanding page components.

Guideline 13: Provide clear navigation mechanisms.

Providing clear and consistent navigation mechanisms such as orientation information, navigation bars, and site maps, increase the likelihood that a person will find what they are looking for at a site. Clear and consistent navigation mechanisms are important to people with cognitive disabilities or blindness, and benefit all users. Link text should be meaningful enough to make sense when read out of context. For example, using a link such as *Information about version 4.3* instead of *click here* adds to clarity.

Guideline 14: Ensure that documents are clear and simple so they may be more easily understood.

Using clear and simple language promotes effective communication. Access to written information can be difficult for people who have cognitive or learning disabilities. Using clear and simple language also benefits people whose first language differs from your own and those people who communicate primarily in sign language.

More information on these guidelines, including checkpoints and examples of techniques is available from the W3C web site.

Validating Accessibility of Web Sites

A checklist which can be used for evaluating any web site for compliance with these guidelines is available online from W3C. While use of the checklist provides for a human review of web sites, the *Bobby* program provides an automated review of web sites (Center for Applied Special Technology, 2000). Bobby is based on the W3C guidelines. While a Bobby review can provide a good general review of potential problems on any

web site, it cannot assure compliance with all guidelines, especially those dealing with readability and navigation. Bobby is a Web-based tool that analyzes Web pages for their accessibility to people with disabilities. The Center for Applied Special Technology (CAST) offers Bobby as a free public service. By entering the URL of a page that you want Bobby to examine and clicking Submit. Bobby will display a report indicating any accessibility and browser compatibility errors found on the page. Bobby will only test one page at a time. If you wish to test an entire site as a batch, use the downloadable version of Bobby. Once all the pages on a site receive a Bobby Approved rating, it is entitled to display the Bobby Approved symbol.

Benefits of Accessible Web Sites

I have had an opportunity to work with faculty from my university's program for training teachers of visually impaired students by assisting them with developing accessible web sites for handicapped individuals. As I learned about designing Web sites for universal accessibility, I came to realize that designing web sites for handicapped individuals not only benefits those with handicaps but just about everyone else as well. For example, use of text equivalents, while benefiting users with disabilities, can also help all users find pages more easily, since search robots use a page's the text when indexing the page. Using good contrast between text and background improves readability for all. Using clear and simple wording improves readability for everyone. Following these guidelines helps improve access and usability of web sites for all, including those with disabilities and those without them. In cases where it is not possible to incorporate all of these guidelines into a page, creating a text based equivalent option is a fairly easy solution. This not only makes the page accessible to many individuals with handicaps; it makes the page readable for those who lack the latest versions of browsers and other web technologies.

For examples of accessible web sites, visit one of the following sites: *The W3C Group, American Council for the Blind, Lighthouse International, National Federation for the Blind,* and *The Texas School for the Blind and Visually Impaired.*

A downloadable Bobby compliant web page template, which can be used by developers, to help them get a head start on designing a more universally acceptable site is available free on the web at the following URL:

http://www.educ.ttu.edu/temp/ada/

This site includes tips to help visually impaired viewers change the appearance of a site with their browser, an alternate text only page, and some useful links.

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Assistive Learning Within a Special Needs Environment

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Abstract: The potential value and importance of assistive and adaptive technologies within the learning environment of special needs students must be emphasized. Students with exceptionalities can be aided through the thoughtful and successful integration of instructionally appropriate technological tools. The potential significance of instructional technologies within a special needs environment is imperative towards the success of the student learners.

Introduction

The reauthorization of IDEA recognizes the potential value and importance of assistive and adaptive technologies for students with exceptionalities. With the recent emphasis and integration of this technology into the mainstream classroom, teacher candidates must become knowledgeable and comfortable with assistive and adaptive technological tools that will aid learners with exceptionalities in the general classroom.

Instructional Technology

The instructional technology available within today's educational environment is becoming available to all levels of the PreK-12 environment at a quickening pace. Because of the diverse needs of students with exceptionalities, teacher candidates need experience with a wide range of assistive/adaptive technologies available to students with exceptionalities. Coursework and field experiences aid in the transition from preservice teacher to inservice teacher with the necessary and sufficient skills to support all learners. The experiences not only benefit teacher candidates but also the students whom they directly work with as well.

As always, instructional technology is just a tool, but a tool that can aid the special needs learner at appropriate points within the learning process. When emphasis is placed upon technology as a mere tool through which learners can access information and create products to display learning, the creativity and inspiration of the learner comes alive. Technology, when integrated into the instructional design of a learning experience, can be a positive influence within a learner's knowledge acquisition and conceptual framework of understanding. Therefore, the careful and thoughtful integration of instructional technology within a learning environment can be a positive influence for the PreK-12 learner.

Assistive and Adaptive Instructional Technologies

Instructional technologies have been integrated within the learning environment for PreK-12 learners with varying success. The emphasis for hardware and software availability is now giving way, as the pendulum swings towards the appropriate and successful integration of instructional technologies into the learning environment. However, we can not ignore the special needs of learners within the classroom environment. Assistive and adaptive technologies offer the technological efforts to not only the general education learners, but also to learners with special needs. First and foremost, we must define what is encompassed within the terms "assistive" or "adaptive" technologies:

> Assistive (or adaptive) technology includes any equipment, software, service, or specialized instructional material that helps disabled persons improve their quality of life and increase their access to education, the workplace, and the community. These devices help people function more independently in nearly all aspects of life, but especially in communication, mobility, learning, and personal care (Pesta, 1994, paragraph 2).

Teacher candidates have available to them numerous types of assistive and adaptive instructional technologies that offer learner-centered, as well as teacher-centered, opportunities to develop basic knowledge of subject matter as well as strive towards higher order thinking skills. During a five-week field experience, teacher candidates select and evaluate various types of assistive/adaptive technology available to the students in their current placement. Candidates thoroughly research various technologies they have access to in the field. Candidates then draw on their research, previous coursework in Special Education and Instructional Technology, and experiences of others to apply what they have learned to the natural teaching environment. Teacher candidates document their understanding of the technology and how it is used with students with exceptionalities via videotape. That is, each candidate presents a brief overview of selected assistive/adaptive technology available in the classroom by describing the technology and its uses. Candidates then demonstrate how the technology is used with the student with an exceptionality within the context of the classroom. The experience provides the opportunity for the teacher candidate to work with the student and the technology together, rather that the technology in isolation.

Candidates and mentor teachers both express value in such opportunities. The videos created by teacher candidates are then shared with their "colleagues. In addition, candidates evaluate the contributions assistive/adaptive technology adds to the quality of life of students with exceptionalities by developing an artistic advertisement of the assistive/adaptive technology available in the classroom. The advertisement reflects the value the technology has on the student's quality of life, the skills that can be learned, and attitude of the child with an exceptionality. Teacher candidates are encouraged to use skills learned in Instructional Technology for all assignments.

Conclusions

The technologies available within today's educational arena have the ability to not only emphasize the strengths of the exceptional learner, but also to further integrate the learner into the general classroom environment. Such opportunities for technology tools must be emphasized within the preservice teacher's coursework to provide a supportive learning environment for all students.

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Special Educators' Technology Literacy: Identifying the Void

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Abstract: This study was initiated to investigate the technological knowledge and skill level of special education teachers and their use of technologies in self-contained and inclusive classrooms as mandated by public law. The study was conducted in two southeastern Florida school districts and included a sample of 210 teachers with a response rate of 69%. The results of this research will report the usage level of 24 technologies in the classroom and will discuss the correlation between teacher skill level and the use or non-use of computers and other technologies for instruction.

Introduction

Having daily classroom access to a variety of technological tools for special education teachers and students may soon be the norm rather than the exception. It is the hopes of many that technology will be used to improve and enhance the learning environment, but evidence has shown, "Without proper teacher training and motivation, technology can land on a shelf" (Clifford, 1998, p.34). Clifford also believes, like others, in the importance of technology in the contemporary classroom:

> Simply put, its role is too important, and the hardware and software involved are too expensive and valuable to allow this to happen. As technology plans are put in place, staff development must be factored in. At the same time, educators understand that the technology is now a critical component in learning, and that staff development in this area needs to be determined, sustained, varied, calculated, supported and frequently individualized (p. 34).

Teachers of students with high incidence disabilities, educating in both regular and special education elementary classroom settings, will need guidance and assurance that possessing technological skills is consequential in the attainment of personal and career goals for themselves and their students. A professional development plan for all teachers ought to include a significant wealth of computer and other technology training programs based upon a needs assessment that will encourage personal goal attainment in technological proficiencies identified through self evaluation. If teachers are to prepare students to meet the educational and vocational plans our children pursue, then it is imperative that all teachers gain knowledge and skills necessary to acquire and maintain a full range of recognizable competencies in this fast moving technological environment.

Special education teachers are becoming much more visible in regular education classrooms during the transition to the inclusion model that is being adopted by schools as mandated in the public laws. Novice special needs

teachers are not unlike the regular education teachers who graduate from NCATE approved teacher preparation programs. They are presumed to have had at least one introductory technology course as well as numerous experiences to see how the integration of technology into the classroom could improve the teaching and learning environment. Unfortunately, during this transitional time, veteran teachers may not have had the same opportunities to acquire basic technology skills essential for today's technological expectations. The intent of this study was to ascertain the current status of the teachers' technological literacy and to identify the utilization or non-utilization of a variety of technological tools in special education programs. The results of this study may contribute helpful information to encourage the preparation of numerous technology workshops and inservice training programs to bring technologies and teachers together, to strengthen the instructional environment in special education classrooms.

Literature Review

The most recent and comprehensive analysis of special education and technology literature published in 1999 "...judged as contributing to the emerging knowledge base on special education technology research and practice," was synthesized by Edyburn, (2000, p. 7). He identified seven topics that dominated the literature: (a) assistive technology; (b) instructional technology; (c) World Wide Web; (d) implementation issues; (e) augmentative communication; (f) teacher training, and (g) accessibility. Teacher training was the focus of only 11 articles identified out of the 144 articles recorded.

Many would agree that teaching with technology in the special education classroom allows for the introduction of multiple instructional methods and modalities that may not be possible without the use of new hardware and software. Numerous research studies have reported the benefits of a diverse and multi-sensory learning environment for learners with disabilities, which also supports the argument that teachers ought to be proficient in the selection and use of computers and other technologies. According to Prinz & Boger-Mehall, (1999), "By using assistive technologies such as multimedia and hypermedia in a lesson, teachers can present information visually, audiologically, and textually" (p. 1570). Improving the technological knowledge and skills of teachers to utilize the variety of technologies would support the multi-sensory theories for instructional purposes and provide additional tools to meet individual goals as set forth by public laws governing education.

Teacher Awareness of Public Laws

There are five public laws that have a profound impact on elementary education in the teaching and learning environments that focus on implications for technology utilization specifically. Well-prepared teachers will be aware of these laws and ought to be able to distinguish the most relevant usage of numerous technological tools that may support individuals' instructional needs. Teacher training in the utilization of both low tech and high tech devices ought to be included in faculty development programs to meet the mandates of these public laws (Cronis & Ellis, 2000).

P.L. 100-407: Technology-Related Assistance for Individuals with Disabilities Act of 1988.
This public law addresses the need for access to technology by individuals with disabilities and their families.

P.L. 101-476: Individuals With Disabilities Education Amendments of 1990.
This public law identifies assistive technology as a specific service to be provided to young children with disabilities, legitimizing technology as an educational tool, and mandating that all students with disabilities be considered for assistive technology as part of their Individual Educational Plans (IEPs).

P.L. 101-336: Americans With Disabilities Act of 1990.
This public law stipulates that classes and educational equipment must be modified to enable participation by students with disabilities.

P.L. 102-119: Individuals With Disabilities Education Act Amendments of 1991.
This public law provides for greater family involvement in early intervention and states that assistive technology devices and services may be part of the Individualized Family Service Plan (IFSP).

P.L. 103-218: Technology-Related Assistance for Individuals With Disabilities Act of 1994.
This public law requires that states develop comprehensive programs of technology-related assistance for all persons with disabilities regardless of age.

Instructional Applications

These laws will benefit only those children with disabilities if our teachers are knowledgeable, trained, and adequately supported in the classroom to use a wide variety of technological tools appropriately. Results from a study that identified the status of assistive technology usage and special education teacher preparedness in northeastern state by McGregor & Pachuski (1996), reported that "In spite of the relatively high self-ratings of technology proficiency, teachers were substantially less satisfied with their ability to use technology in their teaching. Similarly, the largest discrepancies between teachers' ratings of importance and availability of specific technology support involved assistance to set up and program equipment, fiscal resources, and training" (p.13). Our study focused on the identification of the technology needs of teaches and their interest in utilizing numerous technologies in their instruction to provide a more current review of the status of technology use in special education.

The Study

Research Questions

1. How do special education teachers self-rate their technological knowledge and skill level?
2. Given a list of 24 technologies (including hardware & software), do special education teachers use or not use them in their instruction?
3. Is there a correlation between the self-rated knowledge and skill level and the use or non-use of these 24 technologies?
4. What is the special education teachers' level of interest in attending demonstrations or workshops of the 24 technologies?

Participants

The participants in this study were 144 special education elementary teachers assigned in grades P-K to 5 and employed in two school districts in southeastern Florida. School district one had a total student enrollment of approximately 145,000 students and district two had a total student enrollment of 80,000 students. Teachers surveyed included: (a) specialists teaching in varying exceptionalities (cross-categorical) resource classrooms; (b) teachers instructing in self-contained emotional/behavioral disorder classrooms; (c) teachers providing instruction in classrooms implementing inclusion, and (d) teachers serving students in pre-kindergarten special education classrooms.

The mean number of years teaching experience of the respondents was 11.29. Of the 144 participants, 131 or 91% were female, 11 or 7.6% were male. Two teachers did not respond to this question. Thirteen percent of the teachers had assignments in P-K, 26 % of the participants were teaching in grades 1-3, and 29% were assigned in grades 4-5. Additionally, 25 % indicated they taught in other categories: 4% grades 1&2 only; 13% were assigned to grades 2&3 only; and 8% indicated they taught in all grades. Eight percent of the participants did not respond to the grade level teaching assignment question that was asked of the special education teachers.

Instrument Design

The instrument was developed by initially generating a list of important items based upon the researchers' prior experiences developing surveys. Secondly, a draft of instrument was created to elicit information from teachers to determine how well the research questions might be answered. Ten special education teachers reviewed the initial draft and provided feedback and suggestions for improving the questionnaire. The second draft of the instrument was piloted with 18 special education teachers from six elementary schools. The final survey contained 19 items and required approximately fifteen minutes to complete. Quantitative data were collected using the paper and pencil method for completion of the instrument.

Data Collection

After approval from the university as well as the school districts central administration to conduct the study, a letter was sent to elementary school principals in the counties requesting permission to survey the special education teachers. A two week deadline was requested for return of completed surveys. Follow-up phone calls were made after the deadline to increase questionnaire submissions. All questionnaires were returned after eight weeks for data analysis. A total of 210 surveys were distributed and 144 completed surveys were collected for a return rate of 69%.

Data Analysis

The quantitative data from the survey items were analyzed using SPSS for Windows v. 10.0. A Microsoft Excel 2000 speadsheet was designed to improve the reliability and ease of entering and organizing the data from the completed survey.

Results

Addressing the Research Questions

In order to answer the research questions, the participants were first surveyed on whether or not they used 24 different technologies in their instruction. These technologies included: (a) VCR; (b) Laser Disk; (c) Computer; (d) Printer; (e) CD-ROM; (f) Scanner; (g) Camcorder; (h) Digital Camera; (i) Conferencing Camera; (j) Touch Windows; (k) Switches; (l) Power Pad; (m) Intellikeys; (n) Muppet Keyboard; (o) Voice Recognition Software; (p) Word Processing Software; (q) Presentation Software; (r) Desktop Publishing Software; (s) Spreadsheets; (t) Database Software; (u) Electronic Mail; (v) Web Browsers; (w) Educational Games; and (x) Encyclopedias.

The teachers were then asked the frequency with which they believed they would use each of those technologies in their instruction. Finally the participants were surveyed on their level of interest in attending demonstrations or workshops on each of the technologies. This paper only addresses research questions one, two, and three.

Use of Technologies for Instruction

The teachers reported the use and non-use of the 24 technologies in their classrooms in the following manner: (a) VCR 88.4% used, 11.1% not used; (b) Laser Disk 25.5% used, 74.5% not used; (c) Computer 88.4% used, 11.1% not used; (d) Printer 76.1% used, 23.9% not used; (e) CD-ROM 60.6% used, 39.4% not used;

(f) Scanner 12.6% used, 87.4% not used; (g) Camcorder 24.4% used, 75.6% not used; (h) Digital Camera 11.8% used, 88.2% not used; (i) Conferencing Camera 0% used, 100% not used; (j) Touch Windows 16.2% used, 83.8% not used; (k) Switches 8.9% use, 91.1% not used; (l) Power Pad 3.7% used, 96.3% not used; (m) Intellikeys 8.9% use, 91.1% not used; (n) Muppet Keyboard 2.2% used, 97.8% not used; (o) Voice Recognition Software .7% used, 99.3% not used; (p) Word Processing Software 72.1% used, 27.9% not used;

(q) Presentation Software 17.8% used, 82.2% not used; (r) Desktop Publishing Software 35.6% used, 64.4% not used; (s) Spreadsheets 17% used, 83% not used; (t) Database Software 11.9% used, 88.1% not used; (u) Electronic Mail 15.6% used, 84.4% not used; (v) Web Browsers 14.1% used, 85.9% not used; (w) Educational Games 73.5% used, 26.5% not used; and (x) Encyclopedias 37% used, 63% not used.

Regularity of Use of Technology

An Analysis of Variance (ANOVA) procedure was used to compare the mean scores among the four skill level groups identified through the Technology Needs Survey for ESE Teachers, and to determine whether significant differences existed among these four groups in their beliefs of the regularity with which they might use various technologies in their instruction. Analysis of variance, or ANOVA, is a method of testing the null hypothesis that several group means are equal in the population by comparing the sample variance estimated from the group means to that estimated within the groups. This procedure was conducted for each of the 24 technologies included in section four on the survey.

Statistically significant differences were found to exist among the four groups for four of the 24 technologies on the questionnaire including the perceived use of a laser disk player, scanner, camcorder, and digital camera. Table 1 presents an ANOVA summary for the questions pertaining to these four technologies. Once it was determined that differences existed among the means for these four technologies, Tukey's Honestly Significant Difference (Tukey HSD) post-hoc comparison tests were performed to determine which skill level groups among the four differed significantly in their beliefs about which technologies might be useful in their instruction. The Tukey method uses the standardized range statistic to make all of the pairwise comparisons between groups. This method is designed to compute all pairwise comparisons while maintaining the experiment-wise error rate at the pre-established alpha level, in this case 0.05. The four skill level groups of the questionnaire were used as the factor for purposes of this statistical analysis. The questions pertaining to the possible frequency of use of 24 different technologies in instruction served as the dependent list.

Table 1
ANOVA Summary for Technological Needs Survey (Questions 17BUSE, 17FUSE, Q17GUSE and Q17HUSE)

Variable	Source of Variation	SS	df	MS	F	Sig.
Laser Disk (Q17BUSE)	Between Groups	17.61	3	5.870	3.28	.025
	Within Groups	164.88	92	1.792		
	Total	182.49	95			
Scanner (Q17FUSE)	Between Groups	21.62	3	7.21	3.77	.013
	Within Groups	172.30	90	1.92		
	Total	193.93	93			
Camcorder (Q17GUSE)	Between Groups	24.63	3	8.21	5.16	.002
	Within Groups	148.05	93	1.59		
	Total	172.68	96			
Digital Camera (Q17HUSE)	Between Groups	35.98	3	11.99	6.45	.001
	Within Groups	167.29	90	1.86		
	Total	203.28	93			

Questions: How regularly do you believe a laser disk player, a scanner, a camcorder, or a digital camera could be integrated into your instruction?

Statistically significant differences were found among the four skill level groups in their perceived regularity of use in instruction of a laser disk player [F (3, 92) = 3.28, p = .025], a scanner [F (3, 90) = 3.77, p = .013], a camcorder [F (3, 93) = 5.16, p = .002], and a digital camera [F (3, 90) = 6.45, p = .001]. Those participants identifying themselves as beginners responded statistically significantly different in their perceived frequency of use of a laser disk player, a scanner, and a camcorder in their instruction than those participants who identified themselves as being intermediates. No statistically significant differences were found among any other skill level groups with respect to their perceived frequency of use of these first three technologies.

Those participants identifying themselves as beginners responded statistically significantly different in their perceived frequency of use of a digital camera in their instruction than those participants who identified themselves as being intermediates or advanced users. No statistically significant differences were found among any other skill level groups with respect to their perceived regularity of use of a digital camera. In all cases, the beginners responded that they believed they would use these technologies less regularly in their instruction than the intermediates or the advanced users. It is even more interesting to note that those identifying themselves as

novice users of technology did not respond significantly different than advanced users in their perceived regularity of use of 24 technologies.

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